WHAT IS CLAIMED IS:

1. A high throughput processing system, the system comprising:

(a) a plurality of rotational robots, wherein each of the rotational robots has a reach which defines a work perimeter associated with that rotational robot;

(b) at least one device associated with each of the work perimeters, wherein at least one of the work perimeters has two or more devices exclusively within the reach of the rotational robot associated with that work perimeter;

(c) one or more transfer stations associated with at least a first work perimeter and a second work perimeter, for transferring one or more samples from the first work perimeter to the second work perimeter; and

(d) a plurality of sample holders, which sample holders are transported between two or more devices or between two or more work perimeters during operation of the system.

2. The high throughput processing system of claim **1**, wherein members of a first set of sample holders each comprise a plurality of test samples.

3. The high throughput processing system of claim **2**, wherein the test samples comprise chemical or biochemical compounds, nucleic acids, peptides, polypeptides, proteins, carbohydrates, cells, serum, phage particles, virions, enzymes, cell extracts, lipids, or antibodies.

4. The high throughput processing system of claim **3**, wherein the test samples comprise a library of cDNA molecules.

5. The high throughput processing system of claim **3**, wherein the test samples comprise a library of gene regulatory regions operably linked to a reporter gene.

6. The high throughput processing system of claim **5**, wherein the regulatory regions in the library are derived from genes that are differentially expressed in a cell depending upon the presence or absence of a particular stimulus.

7. The high throughput processing system of claim **3**, wherein the test samples comprise a library of antisense nucleic acids or double-stranded RNA molecules.

8. The high throughput processing system of claim **3**, wherein the test samples comprise a combinatorial library of chemical compounds.

9. The high throughput processing system of claim **2**, wherein a second set of sample holders are assay holders that comprise containers for conducting an assay.

10. The high throughput processing system of claim **9**, wherein the assay containers comprise one or more components of an assay, and a test sample is added to the assay containers to determine the effect of the test samples on the assay.

11. The high throughput processing system of claim **10**, wherein the assay is selected from the group consisting of a G-protein coupled receptor assay, a kinase assay, a protease assay, a phosphatase assay, and a transcription assay.

12. The high throughput processing system of claim **10**, wherein the assay is a cell-based assay.

13. The high throughput processing system of claim **1**, wherein the sample holders comprise one or more of specimen plates, multiwell plates, petri dishes, test tube arrays, vials, crucibles, flasks, reaction vessels, or slides.

14. The high throughput processing system of claim **13**, wherein the sample holders comprise one or more of 1536-well plates, 384-well plates, or 96-well plates.

15. The high throughput processing system of claim **14**, wherein a first work perimeter comprises 384-well plates and a second work perimeter comprises 1536-well plates.

16. The high throughput processing system of claim **1**, wherein the rotational robots each comprise one or more grippers configured to transport the sample holders.

17. The high throughput processing system of claim **16**, wherein the gripper comprises a sensor structured to determine a location of the gripper apparatus relative to the object.

18. The high throughput processing system of claim **16**, wherein the gripper comprises a deflectable member structured to couple the gripper apparatus to a robotic

member, which deflectable member is structured to deflect when the gripper apparatus contacts an item with a force greater than a preset force.

19. The high throughput processing system of claim **1**, wherein the transfer station transfers the one or more samples by transferring a sample holder from a first work perimeter to a second work perimeter.

20. The high throughput processing system of claim **1**, wherein the transfer station comprises a fluid transfer device which transfers samples from a sample holder in the first work perimeter to a sample holder in the second work perimeter.

21. The high throughput processing system of claim **1**, wherein the rotational robots are configured to transport one or more sample holders along a multi-directional path.

22. The high throughput processing system of claim **1**, wherein the system comprises between 2 and 10 rotational robots.

23. The high throughput processing system of claim **1**, wherein the devices are selected from the group consisting of a fluid transfer device, a mixer, an incubator, a storage compartment, a thermocycler, a plate carousel, an automatic sample processor, a detector, and a replating station.

24. The high throughput processing system of claim **23**, wherein one or more of the devices comprises a fluid transfer device.

25. The high throughput processing system of claim **24**, wherein the fluid transfer device comprises an apparatus selected from the group consisting of a pin tool, a syringe, and a pump.

26. The high throughput processing system of claim **24**, wherein at least one of the sample holders is a multiwell plate and the fluid transfer device comprises an array of receptacles arranged such that outlets of the receptacles are aligned with a plurality of wells of the multiwell plate.

27. The high throughput processing system of claim **26**, wherein the fluid transfer device comprises 96 or 384 receptacles.

28. The high throughput processing system of claim **26**, wherein the receptacles are syringes.

29. The high throughput processing system of claim **26**, wherein the fluid transfer device:

aspirates a volume of sample into one or more of the receptacles from a well of a multiwell plate which is aligned with the outlet of the receptacle;

returns a substantial portion of the volume of the aspirated sample to the well of the multiwell plate, the returned volume of the liquid being less than the aspirated volume so that a volume of sample is retained in the receptacle;

dispenses a portion of the retained volume of sample into a well of a second multiwell plate; and

discards any remaining volume of retained liquid.

30. The high throughput processing system of claim **29**, wherein the volume of the aspirated sample is at least several times the volume of dispensed sample.

31. The high throughput processing system of claim **25**, wherein at least one of the sample holders is a multiwell plate and the fluid transfer device is a pin tool that comprises an array of pins that are aligned with a plurality of wells of the multiwell plate.

32. The high throughput processing system of claim **31**, wherein the pin tool further comprises one or more wash stations in which the pins are washed between transfers of fluid from one multiwell plate to another by the pin tool.

33. The high throughput processing system of claim **24**, wherein the fluid transfer device does not comprise disposable pipette tips.

34. The high throughput processing system of claim **33**, wherein no fluid transfer device in the system comprises disposable pipette tips.

35. The high throughput processing system of claim **24**, wherein the fluid transfer device comprises a positive displacement pump coupled to a dispenser valve.

36. The high throughput processing system of claim **1**, wherein one or more of the devices comprises an automatic sample processor.

37. The high throughput processing system of claim **23**, wherein one or more of the devices comprises an incubator or storage compartment.

38. The high throughput processing system of claim **37**, wherein the system comprises storage compartments that provide storage capacity for at least 350,000 samples.

39. The high throughput processing system of claim **38**, wherein the storage compartments provide storage capacity for at least 700,000 samples.

40. The high throughput processing system of claim **39**, wherein the storage compartments provide storage capacity for at least 1,400,000 samples.

41. The high throughput processing system of claim **37**, wherein the incubator or storage compartment comprises:

(a) a housing comprising a plurality of doors, which doors close at least one opening disposed through at least one surface of the housing;

(b) at least one movable shelf disposed within the housing, which shelf is capable of aligning with the opening;

wherein each of the plurality of doors is independently accessible by the rotational robot.

42. The high throughput processing system of claim **23**, wherein one or more of the devices comprises a detector which detects one or more readouts of assay results.

43. The high throughput processing system of claim **42**, wherein the detector comprises a device selected from the group consisting of a fluorescence detector, a spectrophotometric detector, a luminescence detector, a phosphorescence detector, an X-ray detector, a radio-frequency detector, a bar code reader, a mass spectrometer, a radioactivity detector, and an optical detector.

44. The high throughput processing system of claim **42**, wherein the detector comprises a camera which records images of the assay results.

45. The high throughput processing system of claim **44**, wherein the images are digital images.

46. The high throughput processing system of claim **44**, wherein the images are analyzed to determine assay results which indicate a desired effect of a test sample.

47. The high throughput processing system of claim **1**, wherein the system can perform assays of at least 100,000 samples in one day.

48. The high throughput processing system of claim **47**, wherein the system can perform assays of at least 350,000 samples in one day.

49. The high throughput processing system of claim **48**, wherein the system can perform assays of at least 700,000 samples in one day.

50. The high throughput processing system of claim **1**, wherein the sample holders are multiwell plates and one or more of the devices comprises a positioning device that comprises at least a first alignment member that is positioned to contact an inner wall of the multiwell plate when the multiwell plate is in a desired position on the device.

51. The high throughput processing system of claim **50**, wherein the positioning device further comprises a pusher that can move the multiwell plate in a first direction to bring at least a first inner wall of the multiwell plate into contact with one or more of the alignment members.

52. The high throughput processing system of claim **51**, wherein the positioning device further comprises a second pusher that can move the multiwell plate in a second direction to bring a second inner wall of the multiwell plate into contact with one or more alignment members that are positioned to contact the second inner wall of the multiwell plate when the multiwell plate is in a desired position on the device.

53. The high throughput processing system of claim **1**, wherein the sample holders comprise one or more lids.

54. The high throughput processing system of claim **53**, wherein the sample holders are multiwell plates and the lids comprise:

a cover having a top surface, a bottom surface, and a side;

an alignment protrusion extending from the side of the cover, the alignment protrusion positioned to cooperate with an alignment member of the multiwell plate;

a sealing perimeter positioned on the bottom surface of the cover; and

wherein the alignment protrusion facilitates aligning the lid to the plate so that a seal is compressibly received between the sealing perimeter and a sealing surface of the multiwell plate.

55. The high throughput processing system of claim **53**, wherein one or more of the work perimeters comprises a de-lidding station at which a lid is removed from a sample holder.

56. The high throughput processing system of claim **53**, wherein the lid is constructed from stainless steel.

57. The high throughput processing system of claim **1**, further comprising a controller operably coupled to the high throughput processing system.

58. The high throughput processing system of claim **57**, wherein the controller directs transport of the sample holders between one or more of the work perimeters or between one or more of the devices.

59. The high throughput processing system of claim **58**, wherein said transport is non-sequential or non-linear transport.

60. The high throughput processing system of claim **57**, wherein the controller is configured to receive operator instructions and provide operator information.

61. The high throughput processing system of claim **60**, wherein the operator instructions are received through a graphical user interface.

62. The high throughput processing system of claim **57**, wherein a separate controller controls each rotational robot.

63. The high throughput processing system of claim **62**, wherein the system further comprises an operator interface that receives operator instructions and provides operator information from each controller.

64. The high throughput processing system of claim **1**, further comprising an operator alert operably coupled to the system.

65. The high throughput processing system of claim **64**, wherein the operator alert comprises a visual alert, an audio alert, or a paging alert.

66. The high throughput processing system of claim **1**, wherein the system comprises a first work perimeter directed to test sample storage and a second perimeter directed to performing an assay.

67. The high throughput processing system of claim **66**, wherein the test samples comprise chemical compounds.

68. The high throughput processing system of claim **66**, wherein the transfer station comprises a fluid transfer device that transfers an aliquot of a test sample from a sample holder that comprises test samples to an assay sample holder in which an assay is to be performed.

69. The high throughput processing system of claim **68**, wherein the assay sample holder comprises one or more of living cells, cell extracts, nucleic acids, polypeptides, antibodies, or chemicals.

70. The high throughput processing system of claim **66**, wherein the assay comprises one or more of a biochemical, chemical, biological, microbiological, or cell-based assay.

71. The high throughput processing system of claim **66**, wherein the second work perimeter comprises an incubator for maintaining the assay sample holders in a desired environment.

72. The high throughput processing system of claim **66**, wherein the system further comprises a detection device for collecting data from the assay.

73. The high throughput processing system of claim **72**, wherein the detection device is located in the second work perimeter.

74. The high throughput processing system of claim **72**, wherein the detection device is located in a third work perimeter.

75. A method of performing a high throughput assay, the method comprising:

(a) providing a library of test samples in a plurality of multiwell plates, wherein the multiwell plates are present in a high throughput processing system that comprises:

(i) a plurality of rotational robots, wherein each of the rotational robots has a reach which defines a work perimeter associated with that rotational robot;

(ii) at least one device associated with each of the work perimeters, wherein at least one of the work perimeters has two or more devices exclusively within the reach of the rotational robot associated with that work perimeter; and

(iii) one or more transfer stations associated with at least a first work perimeter and a second work perimeter, for transferring one or more samples from the first work perimeter to the second work perimeter;

(b) executing a computer program which directs the high throughput processing system to:

(i) dispense aliquots of the test samples into assay plates;

(ii) dispense cells, reagents, and other assay components into the assay plates; and

(iii) transfer the assay plates to a detector which determines the results of the assay.

76. The method of claim **75**, wherein the library of test samples is stored in a first work perimeter and the assay reagents are dispensed in a second work perimeter.

77. The method of claim **76**, wherein the detector is present in a third work perimeter.

78. A method of defining a process for operation on a high throughput processing system as provided in claim 1, the method comprising:

(a) creating a plurality of device steps, each device step instructing one of the one or more devices in the high throughput processing system;

(b) creating a plurality of move steps, each move step instructing that at least a first member of the plurality of rotational robots move one or more of the sample holders to one of the one or more devices; and,

(c) arranging the device steps and the move steps into a step list, the step list defining an order for performing the process.

79. A method of transferring a plurality of samples from two or more members of a first set of multiwell plates to a member of a second set of multiwell plates, the method comprising:

(a) providing the two or more members of the first set of multiwell plates, which members comprise the plurality of samples, wherein each member comprises a marker in at least a first well of the multiwell plate;

(b) transferring the plurality of samples and the marker from the members of the first set of multiwell plates to a member of the second set of multiwell plates; and

(c) determining the location of the marker from each member of the first set of multiwell plates in the member of the second set of multiwell plates.

80. The method of claim **79**, wherein determining the location of the markers comprises visual monitoring or fluorescent monitoring.

81. The method of claim **79**, wherein the members of the second set of multiwell plates have a number of wells that is a whole number multiple of the number of wells in the members of the first set of multiwell plates.

82. The method of claim **81**, wherein the first set of multiwell plates are 96-well plates and the member of the second set of multiwell plates is a 384-well plate.

83. The method of claim **81**, wherein the first set of multiwell plates are 384-well plates and the member of the second set of multiwell plates is a 1536-well plate.

84. The method of claim **81**, wherein the first set of multiwell plates are 96-well plates and the member of the second set of multiwell plates is a 1536-well plate.

85. The method of claim **81**, wherein samples and markers are transferred from four members of the first set of multiwell plates to one member of the second set of multiwell plates.

86. The method of claim **79**, wherein each member of the first set of multiwell plates from which samples are transferred to a member of the second set of multiwell plates comprises a marker which differs from the marker in other members of the first set of multiwell plates that are transferred to the member of the second set of multiwell plates.

87. The method of claim **86**, wherein the markers comprise colored dyes and the markers differ in the color of the dye.

88. The method of claim **86**, wherein the markers comprise fluorescent dyes and differ in the concentrations of the fluorescent dyes.

89. The method of claim **86**, wherein the marker in each member of the first set of multiwell plates comprises both a fluorescent dye and a colored dye, and the markers differ among members of the first set that are transferred to a member of the second set of multiwell plates in the color of the colored dye and the concentration of the fluorescent dye.